

USING SOCIAL NETWORKING SITES TO FACILITATE TEACHING AND LEARNING IN THE SCIENCE CLASSROOM

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The term *social networking site* refers to a web system that allows a group of people to connect and communicate virtually; one of the most famous examples is Facebook. More and more of our students, so-called “digital natives” (Prensky 2001), use social networking sites in their daily lives to share information through multimodal formats, such as images, videos, graphics,

spreadsheets, and charts created using information and communication technologies (ICTs). ICTs are hardware and applications that help users access, retrieve, process, and communicate information (Hsu, Wang, and Runco, forthcoming). ICTs enable teachers and students to research information using extensive resources, produce work in multimedia formats to communicate their thoughts and ideas, collaborate,

and extend discussion through virtual learning communities. To meet this generation's strong interest in technology, many teachers have adopted ICTs to enhance student learning. Social networking sites are the perfect platform to allow teachers and students to organize, collaborate, share, and discuss artifacts created using various ICTs.

Teachers play a crucial role in facilitating students' existing technology skills in the academic setting and cultivating new literacy in the digital era (Hsu and Wang 2011). The term *new literacy* refers to the knowledge and skills used in digital technologies to "identify questions, locate information, evaluate the information, synthesize information to answer questions, and communicate the answers to others" (Leu et al. 2004). Students need to be equipped with this set of skills to be successful future members of the workforce. The integration of social networking sites and ICTs provides meaningful ways for teachers to enrich students' learning experiences and to cultivate students' new-literacy skills.

There has been an increasing acknowledgment of the education benefits of social networking tools and their role in student learning. For example, the New York City Department of Education recently recognized social media's place in education and outlined social media guidelines for educators (2012). This exemplary initiative encourages schools and teachers to adopt social networking sites to support and enrich learning opportunities, while also stressing the importance of using these tools in a way that protects the privacy and safety of both students and teachers. The ability to form learning communities, integrate ICTs, and engage in informal learning with the establishment of social rapport are the greatest features provided by social networking sites. Most social networking sites allow users to create and share multimodal digital resources. Teachers can easily collect and share credible multimedia resources to support students' research, provide scaffolded group discussion, and facilitate students' use of ICTs in the inquiry process.

The National Research Council identified a conceptual framework for K–12 science education (2012), and outlined the three underlying dimensions of the framework: (1) scientific and engineering practices, (2) crosscutting concepts, and (3) disciplinary core ideas. The adoption of social networking sites can especially facilitate the scientific practices within this new framework. In the process of scientific practices,

teachers guide students to form scientifically testable questions, develop models and conduct investigations, interpret numerical data and graphical representation of variables, construct explanations, and communicate findings. These practices are not easy to achieve with limited class time or technologies. With the adoption of social networking sites and free ICTs, teachers can extend these practices to students in a virtual learning environment.

Sample uses: A photosynthesis lab

Here we provide a sample lesson that uses a social networking site to support students' inquiry into photosynthesis. There are several free social networking sites available for K–12 teachers, such as Edmodo, eChalk, Blackboard, and Schoology (see Resources). These sites allow teacher and students to extend discussion beyond the classroom walls and support information sharing in multimodal formats. These sites are also compatible with many free ICTs, such as Google Drive and SkyDrive.

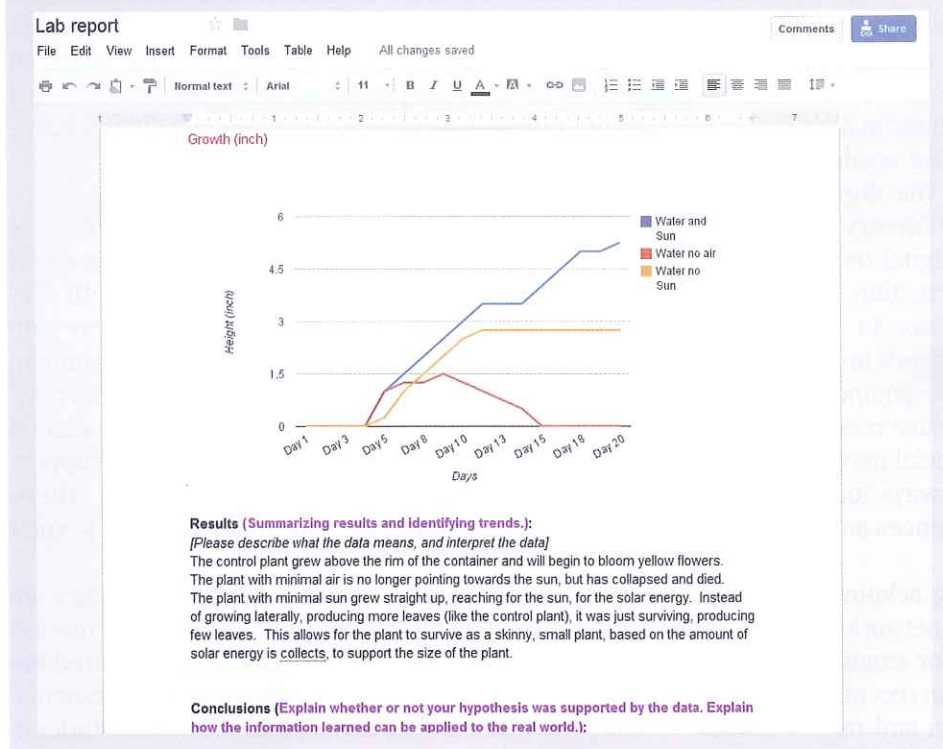
Teachers begin by creating a class page using a social networking site (Edmodo in this case), and use the virtual library to organize curriculum-related, credible digital resources (such as Discovery News and Science Daily). While learning about photosynthesis, students are asked to formulate a scientifically testable research question investigating various factors affecting plant growth. Students then research information through the teacher-provided resources.

The social networking site can also serve as a platform for students to present their projects they produced using ICTs. For instance, during their experiments with growing plants, students use spreadsheets to input their data of plant growth (observed changes by day), insert the spreadsheet into a lab report created through word-processing tools, and produce a chart to compare the height of plants growing under different conditions. (Figure 1 is a sample lab report, including text, images, and chart information.) Students then upload their lab report to the site, along with pictures they took showing plant-growth stages, to share their research findings. Students can also use movie-editing tools to stitch the plant-growth pictures into a video clip to share on the site.

Teachers monitor and guide students through the inquiry process to examine peers' research questions and models, data collection, analysis procedures, and the explanations of the findings on the social network-

FIGURE 1

A sample photosynthesis lab report produced using word-processing, spreadsheet, and chart tools



Concerns and benefits

Internet and mobile devices have become increasingly popular in young people's daily lives, however, many teachers are afraid of adopting these technologies because of security issues. Saying no to these technologies isn't a solution to this problem, though, and precludes the benefits these technologies bring to teaching and learning. The internet is not going away, and social media is one of the ways young people communicate. While some educators embrace social media as an effective learning tool, others have concerns about cyber-bullying and privacy. Instead of restricting access, we should educate young people to participate responsibly, ethically, and safely. Through proper use

of social networking sites, students learn social media etiquette and cultivate their digital citizenship. When teachers choose a social networking site, it is essential to examine whether the platform addresses these concerns effectively and provides maximum control for teachers to monitor students' online interaction. Most social networking sites designed for K-12 learners restrict the exchange of private information among students, and all communication between users is monitored by the teacher. On Edmodo, the class creator/owner (usually the teacher) serves as the moderator, and has the ability to delete, modify, and set restrictions on any student's posts. Students can never send private messages to each other. They can only send a direct message to their teacher, which can only be viewed by the teacher and their parents. In addition, Edmodo allows parents to be involved in their child's learning process. Given an Edmodo-generated code, parents can view any correspondence submitted by and communicated to their child (and only their child).

ing site. In this case, the social networking site allows students to observe their peers' projects and provide feedback. Through this process, students may develop a new perspective on scientific ideas. Not only that, the social networking site extends learning beyond the confines of school and allows students to continue discussion of their work even when they are not in the classroom, and authentic scientific conversation that occurs naturally when students are given a channel to share and discuss their work.

It is important and worthwhile to introduce social networking sites to today's learners because the features of enabling social communication and integrating with ICTs motivate students in the learning process (Eysenbach 2008). Students' opinions and thoughts are valued by their peers in the collaborative discourse and argumentation process within a scientific context. Teachers can benefit from using social networking sites, as well. Edmodo provides a "community" feature through which teachers can make connections with others who teach similar subjects and exchange teaching and learning resources (Figure 2).

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Since peer communication is the main component of social networking, it is important to help students understand “netiquette” (Furgang 2011), the etiquette in the digital world. In order to create a safe online environment for all students, teachers must remind them of the code of conduct and responsible behavior on social networking sites, for example, respecting others’ opinions and not plagiarizing others’ work. Some teachers may worry about plagiarism when having students share their projects with the whole class. In some circumstances, being able to view others’ projects before the assignment deadline encourages students to improve and refine their own work. Teachers who are concerned, however, have the option to allow students to see each other’s projects or to submit projects privately.

Many social networking sites are effectively integrated with various ICTs, such as Google Docs, videos, images, and most MS Office files. More and more teachers and other professionals are using Google Docs in place of word-processing, spreadsheet, and slide-show software, not only because of its powerful functions, but also because it’s free.

Another advantage of Google Docs is the accessibility of what’s called *cloud computing* (online storage and access to documents anytime, anywhere). Both teachers and students can easily integrate these ICTs and cloud documents with social networking sites for later access to documents. For example, students can work collaboratively on data collection using cyber databases (such as Google Public Data Explorer) to research information and input data using spreadsheets to report their findings. Then they can use social networking sites to present their research findings. Their projects can be word-processing documents, presentation slides, spreadsheets, charts, Google Earth files, or video clips. Students’ project formats will not be limited because of the seamless integration between social networking sites and ICTs.

As mentioned above, being able to collect and share digital resources is a powerful strength of social networking sites. Through this feature, teachers can create a “flipped classroom” (Bergmann and Sams 2012), one in which teachers create and collect a series of instructional videos online to allow students multiple reviews of the learning content inside or out-

FIGURE 2

Communities for teachers to share resources on Edmodo

The screenshot displays the Edmodo interface for a Science community. At the top, there is a navigation bar with the Edmodo logo, a search bar, and links for Calendar, Grades, Library, Home, Profile, and Account. The main content area is titled 'Science' and features a 'Post to the Science Community' button. A post by 'Mrs. [Name]' dated Jul 13, 2012, includes a link to a resource. Below it, a post by 'Mrs. [Name]' dated Jul 14, 2012, mentions 'Teaching Secrets: Get to Know Students Through Seating Challenges'. The right sidebar shows 'Trending' topics (Open Resources, Chemistry, Physics, Biology, Earth Science, Science Fairs) and 'Top Content' (Scientific method, The Nature of Science - An Activity, Why Science). The left sidebar shows a list of followers (10750) and a 'See All' link.

side of the classroom based on their learning needs, and turn the class lecture time to hands-on activities and discussion. Teachers can establish a collection of instructional video clips, such as the ones at Khan Academy (www.khanacademy.org) and self-made instructional videos using ShowMe (www.showme.com), to differentiate teaching for students who have diverse learning needs and allow them to repeat the instruction outside of the classroom.

In addition, social networking sites have the potential to become an equalizer, offering all students equal opportunity to ask questions and share their own learning experiences. For example, students who are normally reticent in class may be a “vocal” online presence and, in some cases, show learning styles that might not have been so apparent using conventional methods of teaching.

Using academic social sites as an education tool has advantages because of their versatility in communication in various forms. If teachers need to modify assignment instructions, correspond with parents about specifics in their child’s turned-in or posted work, remind students about important events, or

simply express thoughts that they may not have had time for in class, they can easily do so through a social networking site.

Once teachers and administrators get over their initial inhibitions and start to employ the features that these sites have to offer, they are likely to discover very quickly that these outlets offer an abundance of features that will capture students’ attention, facilitate lessons and assignment submissions, and provide a real-time gauge for parents and administrators of students’ progress, among many other benefits.

A teacher’s classroom experience

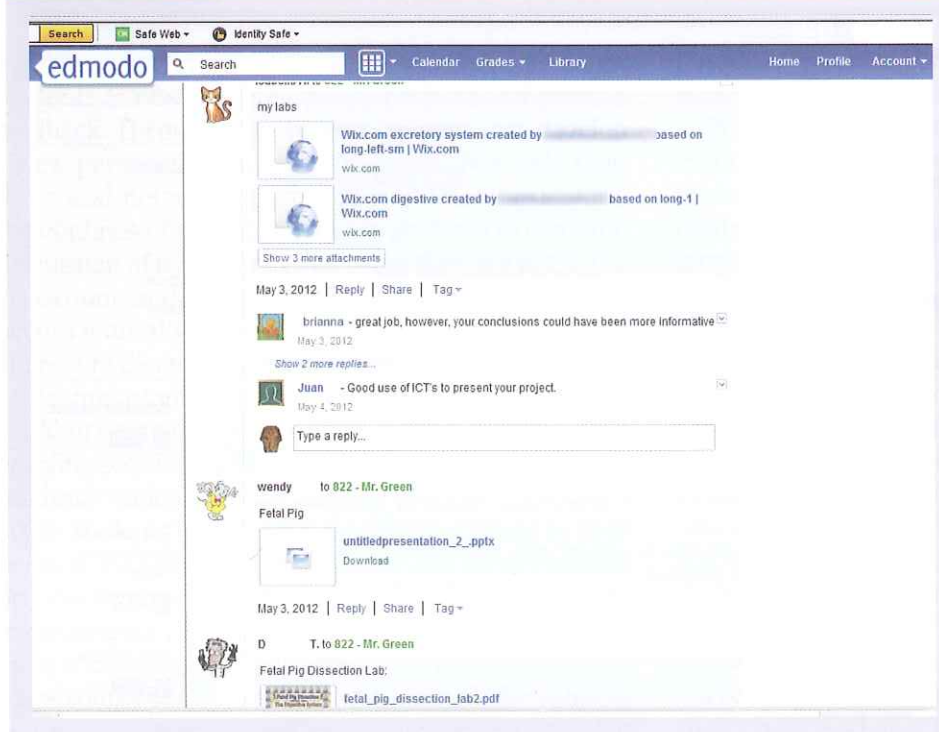
“Hey, Edmodo is just like Facebook.” This is a direct quote from a student who had just completed his first assignment on Edmodo. While that notion may seem inconsequential at first, it indicates the likelihood of students availing themselves of the new form of classroom instruction as well as how much effort they will put into their assignments. Edmodo is intentionally designed to look and “feel” like Facebook and other social media sites that students are already familiar with. Thus, the learning curve for

them is minimal—They already know how to use the vast majority of the wonderful functions offered, from sharing images, to attaching a file, to linking helpful websites to the “wall.”

Stephen Green, a science teacher at the Jean Nuzzi Intermediate School in Queens, New York, participated in a National Science Foundation–supported middle school science teacher professional development program in which teachers adopted Edmodo to facilitate students’ inquiry process. While familiarity doesn’t guarantee that students will like Edmodo, Green found that although students were required to use the site, they spontaneously began to communicate with each other about

FIGURE 3

Students’ comments demonstrate the communication perspective of scientific inquiry on Edmodo



the clarity of homework assignments (not providing direct answers), offer helpful links to sites that they'd discovered, and even ask about class notes and assignments when they'd missed class. After all, unlike Facebook, students don't have "friends"; they are classmates, and whatever they post can be viewed by all of them.

One of the more surprising benefits Green discovered was that he was able to understand his students' learning in a different way when they were working beyond the classroom environment. In particular, students exchanged scientific ideas, collaborating to support their inquiry of the topic of the nature of science. Take Brianna as an example, a student of Green's who made effective use of Edmodo to support and share her investigation. Brianna liked to stir up conversation among her classmates to further discuss the topic they were studying. Figure 3, a screenshot of Green's Edmodo class page, demonstrates how she offered feedback on her peer's work. This feedback provided an enormous benefit to both the students and the teacher. Brianna recognized that scientific inquiry requires more than just following a certain format and providing information and understood that learners need to formulate explanations from evidence to specifically address scientifically oriented questions.

Scientific inquiry is further evident in Brianna's own work. She showed particular strength in the areas of giving priority to evidence, which allowed her to develop and evaluate explanations that addressed scientifically oriented questions. Brianna often chose to submit her lab reports in PowerPoint format because, as she explained, she was able to go beyond plain charts and graphs, incorporating video and animations that would not work on paper. She often supplied pictures of her specimen or activity (taken with her own cell phone camera), and used image-editing tools (e.g., Pixlr) to illustrate and annotate them in conjunction with whatever she was pointing out.

Social networking sites allow students to use multimedia resources and ICTs to demonstrate their scientific inquiry; their multimodal formats of work can be posted, viewed, evaluated, graded, and archived. Through Edmodo, students use ICTs with various formats to synthesize, evaluate, and explain their data. Students are not limited by conventional means of study and expression.

Implementation strategies

Each school system will, of course, have its own guidelines about internet use, especially when it comes to social media. It's a good idea to check with the school principal or other administrator as to the rules and restrictions that may be in place in your school. What follows are suggested strategies for teachers who plan to start using social networking sites with their students.

1. Review "teacher resources" of the social networking sites. For example, Edmodo provides the Teacher Rollout Resources (<http://help.edmodo.com/teacher-rollout-resources>) to facilitate teachers' implementation. If you prefer to use another social networking site, many of the Edmodo resources are still helpful, such as the sample code of conduct and sample invitation to parents.
2. Organize your classroom materials (PowerPoint, Word/pdf documents, hyperlinks) in advance. Digitizing classroom materials ultimately saves you time and allows students access to information anytime, anywhere.
3. Start with a small activity. Ask students to submit one assignment digitally using a social networking site, have them review each other's projects, and then ask them to provide constructive feedback. A coaching rubric can be used to remind students of what's expected of their postings and train them to provide helpful, constructive, and positive feedback and comments. Remind them that their suggestions and feedback should be scientifically based. You will be surprised by how much great information students find and share in the learning community.
4. After they become familiar with the use of social networking sites, you can encourage students to submit assignments in multimodal formats, such as PowerPoint, spreadsheets, charts, images, and video clips.
5. If the school does not have enough computers for every student, teachers can use a central station or SMART Board to demonstrate the use of social networking sites, discuss students' interaction and questions, and summarize students' research. Students can continue the work at home or the library to extend the discussion. Students who do not have access to computers at home or

on a school network can complete their work at public libraries or after-school-program sites. We understand the digital divide might impede the use of technology for student learning, however, with the demand of new literacy in the 21st century, this obstacle should not strip students' of this learning opportunity and their readiness for future careers.

Conclusion

A successful technology integration experience begins with teachers' strong technology skills and confidence. Fortunately, the majority of the social networking sites are easy to use. Taking the first step to switch part of your classroom instruction to social networking sites can be a daunting task, but once you start, you will be amazed by how it can positively change your classroom and support students to apply their technology skills to the context of science learning. ■

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Resources

Social networking sites

Blackboard—www.blackboard.com
eChalk—www.echalk.com
Edmodo—www.edmodo.com
Schoolology—www.schoolology.com

ICTs

Google Drive—<http://drive.google.com>
Google Earth—<http://earth.google.com>
Google Public Data Explorer—www.google.com/publicdata
Pixlr photo editing services—<http://pixlr.com>
SkyDrive—skydrive.com

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